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Serial No. 10/510,384	§	Filing Date: 10/05/2004
International Application	§	Applicant : LECHOT ET AL
No : PCT/IB03/01725	§	
International Filing Date :	§	Title of Invention : Reamer spindle for
April 28, 2003	§	minimally invasive joint surgery
Priority Dates:	§	Authorized Officer
April 30, 2002	§	
May 30, 2002	§	Attorney docket no : 1.P566.31
April 2, 2003		

INFORMATION DISCLOSURE STATEMENT

To:

Mail Stop DD
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Pursuant to the provisions of 37 C.F.R. §1.97, Applicant encloses the references set forth in the attached modified form PTO/SB/O8A. No inference should be made that the cited references are in fact material, are in fact prior art, or that no better art exists. The cited patents are listed in numerical order and not in any order based on their pertinence.

It is requested that the Examiner fully consider the cited references and that they be cited on the front of any patent issuing from this application.

Copies of the cited references are attached.

Statement of Relevance of Foreign Patent Document :

German patent application No DE 2547969 – Milling tool for preparing the joint socket in total prosthetic hip-joint replacement

Background of the invention

The invention relates to a milling tool for preparing the joint socket in total prosthetic hip-joint replacement, with a drive shaft which is driven by a motor and which carries a milling tool body.

To mill out tissue and bone material, the usually hollow, hemispherical milling tool body, having a plurality of milling blades on its outside and having an opening in front of each milling blade, has to be pressed with considerable force against the hip-joint socket and at the same time rotated. The rotation is effected manually via a handgrip secured on the drive shaft or is effected by a drive motor, for example an electric motor or a compressed-air motor.

Because of the limited accessibility of the operating site, it is not possible to secure the milling tool body directly on the shaft of the drive motor or on just a short drive shaft. The drive shaft must have a length of about 30 to 50 cm so that the operating site remains easily accessible during the milling procedure itself, and so that said milling procedure can be monitored. As a result of the considerable length of the drive shaft, it is difficult to apply the necessary axial pressing force and to guide the milling tool with precision.

Summary of the invention

The object of the invention is therefore to design a milling tool of the type mentioned at the outset in such a way that the application of the pressing force and the guiding of the milling tool are effected as close as possible to the milling tool body carrying the milling blades, without thereby adversely affecting the accessibility and clear view of the operating site.

According to the invention, this object is achieved by the fact that the drive shaft between the motor and the milling tool body is mounted rotatably in a support body provided with a handgrip. The axial pressing force can be introduced near to the milling tool body via the handgrip on the support body; the milling tool can be guided with very great precision since said milling tool is guided nearer to the operating site than is possible in cases where guiding is provided only via the drive motor. The size and weight of the drive motor do not impede the guiding of the tool and the clear view of the operating site, because the drive motor is situated away from the operating site by the distance defined by the length of the drive shaft. The operating surgeon holds the drive motor with one hand and, at a distance from this, with the other hand, he holds the handgrip of the support body; in this way it is possible to exert quite a considerable guiding force on the tool.

In an advantageous configuration of the inventive concept, the drive shaft is designed in two parts and is composed of a tool shaft connected to the milling tool body, and of a driven shaft intermediate part, these parts being connected releasably to one another by means of a coupling. It is also possible in this case for the shaft intermediate part, at its end comprising the coupling, to be mounted in the support body.

By means of the coupling, which can for example be a conventional quick-coupling

arrangement, the tools composed of the milling tool body and of the tool shaft can be quickly and easily replaced during the operation without having to release the connection to the drive motor, which connection is often very secure and can be released only with the aid of pliers or the like. For example, it is necessary to replace the tool when, as is customary, successively larger milling tool bodies have to be used during an operation, when a tool with a longer shaft is required, or when the hollow milling tool body has filled so much with milled-off tissue material that it has to be changed, in order to be emptied after the operation.

According to a further development of the inventive concept, the support body which is provided with the handgrip, and in which the drive shaft is rotatably mounted, can be adjusted to different positions along the drive shaft axis and be axially fixed.

The fact that the support body can be axially adjusted and then fixed in different axial positions on the one-part or two-part drive shaft means that the position at which the drive shaft is supported and guided can be shifted in the manner necessary and expedient for the particular operating procedure, in particular for adapting to different anatomical conditions of the patients.

According to an advantageous embodiment of the inventive concept, a sleeve is guided in a rotationally fixed but axially adjustable manner in the support body, in which sleeve the drive shaft is mounted rotatably and is axially fixed. This embodiment has the advantage that the rotation bearing and the axial fixing and adjustability between the support body and the drive shaft of the tool are separated from one another, such that the axial adjustment takes place between two structural components which do not turn relative to one another. In a particularly simple design, which affords a particularly high level of mechanical strength, the support body can be fixed in several axial positions by locking with a form fit on the sleeve. The locking arrangement is particularly easy to actuate, even while handling the milling tool, if it is provided in an expedient embodiment in which a ring surrounding the sleeve with play is guided in the support body and is pressed against the sleeve by means of a spring and locks in recesses provided on the sleeve.

In another advantageous embodiment of the milling tool according to the invention, a bushing connected to the drive shaft in an axially adjustable manner is mounted rotatably in the support body. The bushing can preferably be secured by clamping in any desired axial positions on the drive shaft, so that no rotation bearing has to be provided on the drive shaft. Several possible ways of achieving an easily adjustable device for clamping the bushing to the drive shaft form the subject matter of the dependent claims.

<u>Description of the drawing</u>

The invention is explained in greater detail below on the basis of illustrative embodiments depicted in the drawing, in which:

Fig. 1 shows a milling tool for preparing the socket of a hip joint, with a drive motor (only part of which is shown), a support body (shown in cross section) and a hemispherical milling tool body,

Fig. 2 shows a cross section along the line II-II in Fig. 1,

Fig. 3 shows a partial cross section through a modified embodiment of the support body,

Fig. 4 shows a cross section along the line IV-IV in Fig. 3,

Fig. 5 shows a support body with a sleeve that can be clamped securely on the drive shaft,

Fig. 6 shows a cross section along the line VI-VI in Fig. 5,

Fig. 7 shows an embodiment, modified in relation to Fig. 5, of a sleeve that can be clamped securely on the drive shaft,

Fig. 8 shows a cross section along the line VIII-VIII in Fig. 7,

Fig. 9 shows a cross section along the line IX-IX in Fig. 8,

Fig. 10 shows, in a partial longitudinal section, a two-part sleeve which is mounted in the support body and whose two parts can be clamped obliquely relative to one another,

Fig. 11 shows a partial longitudinal section through a guide body with a sleeve which is mounted rotatably therein and which can be partially radially clamped,

Fig. 12 shows a cross section along the line XII-XII in Fig. 11,

Fig. 13 shows, in longitudinal section, a milling tool with two-part drive shaft whose shaft intermediate part is mounted without axial adjustability in the support body, and

Fig. 14 shows a cross section along the line XIV-XIV in Fig. 13.

Description of the preferred embodiments

In all the illustrative embodiments shown, a motor 1, for example an electric motor or compressed-air motor, drives a drive shaft, which can be designed as a one- part shaft 2 (Figures 1 through 12) or as a two-part shaft (Figures 13 and 14) and at whose other end a hollow, removable hemispherical milling tool body 4 with milling blades 5 is fitted via a cover or flange 3 connected to the drive shaft. The milling tool body 4 has to be pressed axially into the hip-joint socket to be worked and, in so doing, must be guided such that it does not deflect sideward.

In the illustrative embodiment shown in Fig. 1, a sleeve 7 is guided in a rotationally fixed manner in a support body 6. The drive shaft 2 is mounted rotatably in the sleeve 7 via bearing bushings 8, 9 at the end of the sleeve 7; the drive shaft 2 is axially supported on the bearing bushings 8, 9 via a fixed collar 10 and a ring 11 that is detachable for assembly purposes.

A handgrip 12 is fitted on the support body 6. In a slit 13 of the support body 6, a ring 14 can be displaced transversely with respect to the longitudinal axis of the drive shaft 2. The ring 14

is connected to a bolt 15 which is guided in a bore 16 of the handgrip 12 and is pressed against the sleeve 7 by a compression spring 17 in such a way that a pin 18 fitted in the inner bore of the ring 14 can lock into bores 19 arranged at the bottom of a longitudinal groove 20 of the sleeve 7.

When the bolt 18 is locked in a bore 19, the handgrip 12 can be used to press and guide the milling tool with the necessary axial force. If the axial distance between the support body 6 and the milling tool body 4 is to be changed, for example increased, because the operating site is less easily accessible, the operator presses on the ring 14, at the side remote from the handgrip 12, until the bolt 18 escapes from a bore 19; the support body 6 is then brought to the desired axial position and locks once again into the next bore 19.

It will be seen from Fig. 2 that the width of the groove 20 is equal to the diameter of the bores 19, so that the bolt 18, even in the escape position, prevents rotation of the sleeve 7 in the support body 6.

The embodiment according to Figures 3 and 4 differs from the described embodiment only in terms of the nature of the locking connection between the ring 14 and the sleeve 7. Here, the sleeve 7 has, on its underside, a ledge 21 in which right-angled notches 22 are provided into which the ring 14 can lock.

In the example according to Figures 5 and 6, the support body 6 provided with the handgrip 12 has a bearing slot 23 in its inner bore for receiving a collar 24 of a bushing 25. At its end remote from the collar 24, the bore of the bushing 25 is conically shaped. An outwardly corresponding conical clamping sleeve 26 with radial slits 27 can be pushed axially into the bushing 25 by means of a screwthread connection and can in this way be connected with a force fit to the drive shaft 2. When the parts 25 and 26 connected to one another by the screwthread 28 are turned relative to one another, the support body 6 can be axially adjusted in a stepless manner and fixed on the drive shaft 2.

Figures 7, 8 and 9 show an illustrative embodiment in which a bushing 29 is likewise mounted rotatably in the support body 6. The bushing 29 is provided along part of its length with a radial slit 30 separating two bushing parts 29a, 29b which can be braced tangentially against one another and which have a bore 31 engaging with a form fit around the drive shaft 2. A lever 32 is mounted in one bushing part 29a, which lever 32 presses with its cam 32a against a surface 29c of the other bushing part 29b when the semicircularly curved lever 32 is moved out of the position shown in Fig. 8 into a recess 33 of the bushing 29. In the unstressed state, the diameter of the bore 31 is slightly smaller than the diameter of the drive shaft 2, so that the drive shaft 2 is clamped securely with a force fit in the bore 31 when the lever 32 is released (position according to Fig. 8). When the lever 32 is pulled out, so that the cam 32a presses against the surface 29c, the bore 31 is thereby widened by the elastic deformation of the bushing parts 29a, 29b and frees the drive shaft 2, so that axial adjustment can be effected.

The embodiment according to Figures 11 and 12 only differs from the previously described embodiment mainly in that the two bushing parts 29a, 29b, which here are separated by a wedge-shaped slit 34 at part of the circumference, are spread open by means of a wedge 35 which can be moved radially in the slit 34 without self-locking and which is guided in the slit 34 by means of a kind of feather key guide 36. An approximately spiral-shaped control cam 37 of a ring 38 presses from the outside on the wedge 35. The ring 38 is mounted rotatably on

the bushing 29, which in turn is mounted rotatably in the support body 6. To make it easier to turn the ring 38 in the direction of the double arrow in Fig. 12, the bushing 29 has a grip piece 39 on the opposite side.

In the illustrative embodiment according to Fig. 10, a clamping ring 42 is articulated, via a hinged joint 41, on a bushing 40 mounted rotatably in the support body 6; a compression spring 43 on the side remote from the joint 41 presses the ring 42 away from the bushing 40. In the event of a relative movement in the direction of the arrows 44a, 44b, this arrangement acts as a block. (In contrast to the example shown in Fig. 1, the milling tool body 4 would be arranged to the left of the support body 6 so that an axial force can be exerted from the handgrip 12 in the direction of the milling tool body 4 via the blocking parts 40, 42). In the direction counter to the arrows 44a, 44b, a relative movement between the drive shaft 2 ad the support body 6 is freely possible without a clamping part having to be released to do so.

For the sake of simplicity, in the depiction of the illustrative embodiments, no account has been taken of the possibilities of assembly. It will be appreciated that, for example, the support body 6 can be designed in parts so as to receive the collar 24 of the bushing 25 or of the bushing 29 (examples 5 through 12).

Fig. 13 shows a two-part design of the drive shaft which is here made up of a tool, shaft 50 connected to the milling tool body 4 and of a shaft intermediate part 51 which has a connector pin 52 for a quick-action chuck 53 (indicated only by broken lines) of the drive motor.

The tool shaft 50 and the shaft intermediate part 51 are connected to one another by a releasable quick-coupling arrangement. For this purpose, the tool shaft 50 has, at its coupling end, a hexagonal section 54, a coupling groove 55 and an end pin 56. The shaft intermediate part 51 terminates, at the coupling end, in a sleeve 57 which has a hexagonal bore 58 for receiving the hexagonal section 54 and is mounted via slide bearings 59 in the support body 6.

Coupling pins 61 (Fig. 14) which hold the tool shaft 50 in its groove 55 lie in two oblique slits 60 of the sleeve 57. The free ends of the pins 61 lie between a ring 63, pressed leftward in Fig. 13 by a spring 62, and a collar 64 of a sliding sleeve 65, on whose other end the spring 62 is supported likewise on a collar 66.

When the sliding sleeve 65 is displaced to the right in Fig. 13, the pins 61 in the oblique slits 60 are moved out and free the tool shaft 50, which can be easily drawn out in order to replace the tool, without the chuck 53 having to be released.

If the sleeve 57 is designed longer than is shown in Fig. 13, axial displaceability of the support body 6 can also be provided in a manner similar to that previously described. For example, it is also possible to arrange the support body rotatably, but axially displaceably, on the tool shaft 50.

Claims:

1. A milling tool for preparing the joint socket in total prosthetic hip-joint replacement, with a drive shaft which is driven by a motor and which carries a milling tool body, wherein the drive shaft (2, 50, 51) between the motor (1) and the milling tool body (4) is mounted rotatably in a support body (6) provided with a handgrip (12).

2. The milling tool as claimed in claim 1, wherein the drive shaft is designed in two parts and is composed of a tool shaft (50) connected to the milling tool body (4), and of a driven shaft intermediate part (51), these parts being connected releasably to one another by means of a coupling (54, 58, 61).

3. The milling tool as claimed in claim 2, wherein the shaft intermediate part (51), at its end comprising the coupling, is mounted in the support body (6).

4. The milling tool as claimed in claim 2 or 3, wherein the shaft intermediate part (51) has, at one end, a sleeve (57) which receives the coupling end of the tool shaft (50) and which is mounted rotatably in the support body (6).

5. The milling tool as claimed in claim 1 or 2, wherein the support body (6) which is provided with the handgrip (12), and in which the drive shaft (2, 50, 51) is rotatably mounted, can be adjusted to different positions along the drive shaft axis and be axially fixed.

6. The milling tool as claimed in claim 5, wherein a sleeve (7) is guided in a rotationally fixed but axially adjustable manner in the support body (6), in which sleeve (7) the drive shaft (2) or the shaft intermediate part (51) is mounted rotatably and is axially fixed.

7. The milling tool as claimed in claim 6, wherein the support body (6) can be fixed in several axial positions by locking with a form fit on the sleeve (7).

8. The milling tool as claimed in claim 7, wherein a ring (14) surrounding the sleeve (7) with play is guided in the support body (6) and is pressed against the sleeve by means of a spring (17) and locks in recesses (19, 22) provided on the sleeve.

9. The milling tool as claimed in claim 5, wherein a bushing (25, 29, 40) connected to the drive shaft (2) in an axially adjustable manner is mounted rotatably in the support body (6).

10. The milling tool as claimed in claim 9, wherein the bushing (25, 29, 40) can be securely clamped on the drive shaft (2).

11. The milling tool as claimed in claim 10, wherein the clamping connection of the bushing (25) to the drive shaft (2) has a radially slit clamping sleeve (26) which can be braced by means of a conical surface through axial tightening of a screwthread connection (28).

12. The milling tool as claimed in claim 10, wherein the bushing (29) is radially slit along at least part of its length and has two bushing parts (29a, 29b) which can be braced tangentially relative to one another and which have a bore (31) engaging with a force fit around the drive shaft (2).

13. The milling tool as claimed in claim 12, wherein a lever (32) is mounted in one bushing part (29a) and can be pressed by a cam (32a) against a surface (29c) of the other bushing part (29b).

14. The milling tool as claimed in claim 12, wherein a wedge (35) can be driven radially in between both bushing parts (29a, 29b) without automatically locking, and a control cam (37)

of a ring (38) able to rotate on the bushing (29) acts radially from the outside on said wedge (35).

15. The milling tool as claimed in claim 10, wherein the bushing (40) is on one side connected to a clamping ring (42) via a hinged joint (41), and, on the side directed away from the hinged joint (41), a spring (43) acts between the bushing (40) and the clamping ring (42).

European patent application No EP 0 261 260 – Surgical bone drill

In a surgical bone drill with a receiving housing for the electromotive drive of a holding device, in particular for drill tools, and with a grip part which is arranged on the receiving housing and which receives an electrical current source, in order to ensure a stable holding and fine guiding of the same, there is arranged on the grip part (5), at the end facing away from the receiving housing (1), a housing (6) which projects beyond the side surfaces of the grip part (5) and is used for accommodating the current source. The grip part (5) is provided in areas in the side surfaces with indents (9, 10, 11, 12, 13) which, together with the edge surfaces (15) of the housing (6) facing towards the receiving housing (1), form support surfaces for a metacarpal area and for the fingers of the user's hand.

European patent application No EP 1074225 – Tool driver and tools therefor

There is provided a tool driver (10) having a shaft (12) with a longitudinal axis and opposite ends (14,16) and tools therefor. A boss (18) is secured at one of said shaft ends (16) by which the tool driver is connected to a rotary tool (110,112). A tool collet (20) is secured at the other of the shaft ends (16) by which the tool driver may be driven by a surgical hand piece having a chuck in which the collet may be positioned. The boss has a surface (38) which engages the tool and positions the tool exactly coaxially of the tool driver. A latch mechanism (40,70) is provided to hold the rotary tool on the boss, whereby the rotary tool is held exactly coaxially of the driver during use. The rotary tool which is used with the driver has a bottom tool driver opening (116) which has the same dimensions as the boss of the tool driver of the invention. The boss thus fills the opening and the opening is complementary to the boss. The boss of the tool driver and the bottom tool driver opening of the tool are both positioned precisely coaxial of the axis of the tool and longitudinal axis of the tool driver about which the cutting edges are precisely positioned and rotated.

German patent application No DE 3828478 – Surgical resection instrument

The invention relates to a surgical resection instrument (1) with the aid of which cartilage, chondrosis or a tumor present in a body cavity, e.g. in the cavity of the knee joint, is resected from the outside of the body cavity without any incision and can be removed from the body cavity. This resection instrument (1) has a rigid outer pipe (4) which is releasably fastened on the front of the housing part (2) serving as a holding member and comprising a rotating drive unit (28). The outer pipe (4) is provided with an opening (7) in the vicinity of the front end-part and with a curved part (9) behind the opening (7). The inner pipe (6) is equipped with a cutting part (13) on the front end-part and releasably connected on its rear end-part with the rotating drive unit (28) for resection of body tissues by rotating the cutting part (13). The inner pipe (6) which has a flexible part (12) on at least one site corresponding to the abovementioned curved part (9) is guided through the outer pipe (4).

An early action on the merits is respectfully requested.

If the Examiner has further questions, he is invited to contact the undersigned at phone 011-4122-747-7849 or fax at 011-4122-346-8960, e-mail bugnion@bugnion.ch

Respectfully submitted,

Date: Feb 25, 2005

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Enclosures: IDS form + copies of cited patents

Substitute for form 1449/PTO				Complete if Known	
INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	10/510,384
(Use as many sheets as necessary)				Filing Date	April 28, 2003
				First Named Inventor	LECHOT ET AL
				Art Unit	
				Examiner Name	
Sheet	1	of	2	Attorney Docket Number	1.P566.31

U.S. PATENT DOCUMENTS

Examiner Initials	Cite No	Document Number	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	US-5,814,049	09-29-1998	Kinamed Inc.	Col 5, lines 16-24 Col. 5, lines 36 – 42, fig. 4 Col. 7, lines 4 – 8, fig. 6
	2	US-5,176,711	01-05-1993	James B. Grimes	Col. 6, lines 11 – 13, figs. 7D, 7E, 8
	3	US-2,093,682	09-21-1937	Levy D. D.	Page 1, left-hand col., lines 28 - 56
	4	US-5,697,158	12-16-1997	Klinzing and Babcock	Col. 1, lines 26 – 29 Col. 1, line 43 – col. 2, line 1 Col. 2, lines 15 – 40 Col. 7, lines 4 – 9 Col. 12, lines 48 – 51 Col. 13, line 63 – col. 14, line 22, figs 2, 9
	5	US-6,096,042	08-01-2000	Herbert T. J.	Col. 7, lines 56 – 60, fig. 6
	6	US-5,529,580	06-25-1996	Olympus Optical	Corresponds to patent DE 3828478 cited in the International Search Report
		US-			

FOREIGN PATENT DOCUMENTS

Examiner Initials	Cite No	Foreign Patent Document	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	7	DE 25 47 969	04-28-1977	Weigand H et al	Page 8, line 34 – page 9, line 25, fig. 1
	8	EP 0 261 260	03-30-1988	List H-J and Ricter	Col. 3, lines 1 - 9
	9	EP 1 074 225	02-07-2001	Othy	Col. 5, lines 28 – 31 , fig. 8
	10	DE 38 28 478	05-18-1989	Olympus Optical	Col. 16, lines 27 – 32 Col. 16, line 50, col. 17, line 19 Col. 17, lines 48 – 56 Col. 17, line 67, col. 18, line 16, figs 39 - 41

Examiner Signature		Date Considered	

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				Examiner Name	
Sheet	2		2	Attorney Docket Number	1.P566.31

NON PATENT LITERATURE DOCUMENTS

Examiner Initials	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published	
	11	International Search Report IN SN PCT/IB 03/01725	

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